McIDAS-V: A Powerful Visualization and Data Analysis Tool for Geostationary Environmental Satellites

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VisAD + IDV + HYDRA ➡ McIDAS-V

VisAD + IDV: The Core of McIDAS-V

The foundation of McIDAS-V is:
• SSEC's Visualization for Algorithm Development (VisAD)
• Unidata's Integrated Data Viewer (IDV)
Both are built in Java™ to provide a versatile data analysis and visualization toolkit for geoscience data. Key attributes of VisAD and IDV include:
• A mathematical data model that accommodates any numerical data set
• A general display model that supports 2-D and 3-D displays
• Direct manipulation of multiple data views
• Metadata that is integrated into each data object
• Adapters for data formats: netCDF, HDF-4, HDF-5, McIDAS, Vis5D, etc.
• Access to remote data servers: HTTP, FTP, DODS/OPeNDAP, WMS, ADDE protocols

HYDRA: Innovative Data Analysis Tools

• The Hyperspectral Data Research Application (HYDRA), also developed at SSEC, allows scientists to interrogate and display multi- and hyper-spectral satellite data.
• Display radiance spectra, multi-band imagery, scatter plots and transects.

HYDRA: Multi-Band Scatter Plots

Below is a SEVIRI window channel (band 9-left); visible channel (band 1-middle); scatter plot of IR brightness temperature vs. visible reflectance (right). Groups of pixels can also be identified on the images (hand drawn in N Africa) and colorized (green) in the scatter plot. Alternatively, groups of pixels can be selected in the scatter plot and colorized in the imagery. Here cold IR 11μm brightness temperature and high visible reflectance identifies probable thunderstorm clouds (blue). This HYDRA capability within McIDAS-V allows for detailed interrogation of spectral data and is valuable for education and training.
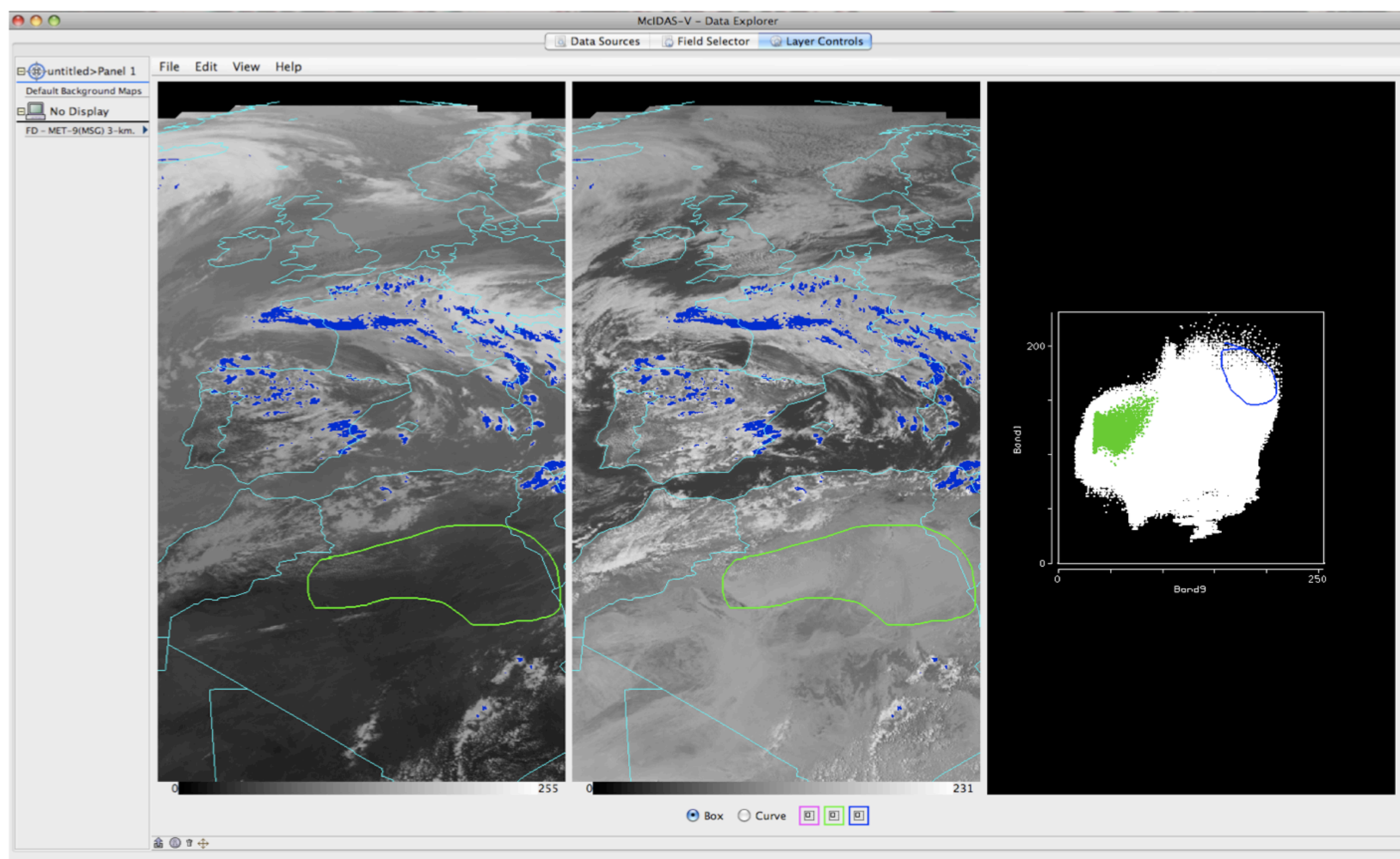
McIDAS-V is open source, freely available software
### http://www.ssec.wisc.edu/mcidas/software/v/

Data Analysis and Visualization in 4 Dimensions

McIDAS-V is able to display images and data in three spatial dimensions and with time. This example from the SSEC/CIMSS Convection project for NOAA GOES-R Risk Reduction shows rendering of the WRF model cloud water iso-surface colored by synthetic 2 km GOES-R ABI IR window brightness temperature, as viewed from above (left), side (center), and cross-section (right) (K. Bedka).
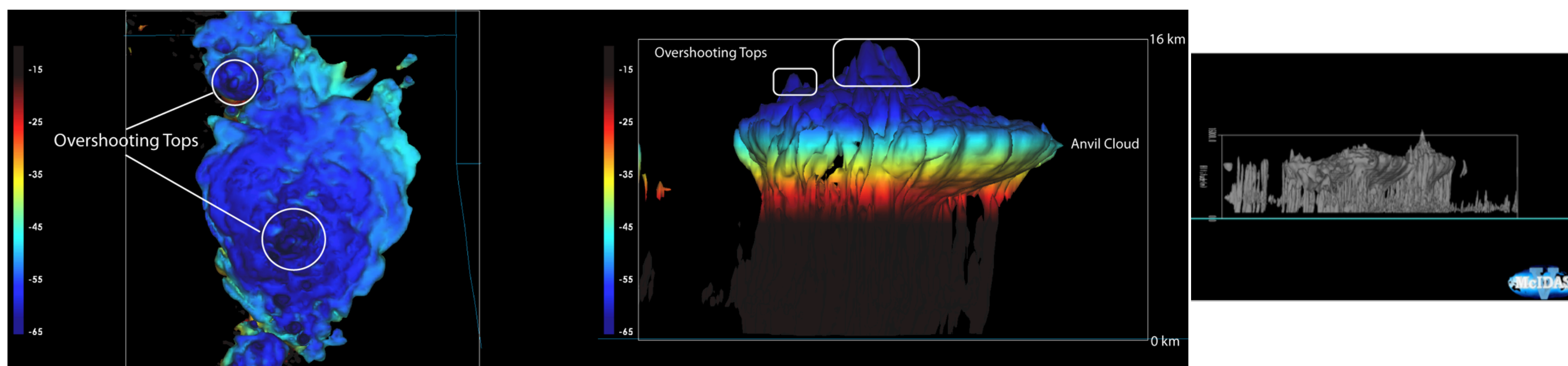
Validation Through Data Co-location

The McIDAS-V image (right) shows consecutive MODIS overpasses across North America with coincident passes of CALIPSO vertical backscatter measurements. Co-locating these observational data allows aerosol and cloud products developed from MODIS to be evaluated using the highly accurate CALIPSO lidar data. McIDAS-V 3-dimensional visualization allows the user to zoom into individual pixels and to use vertical probes to display instrument measurement information for those locations.
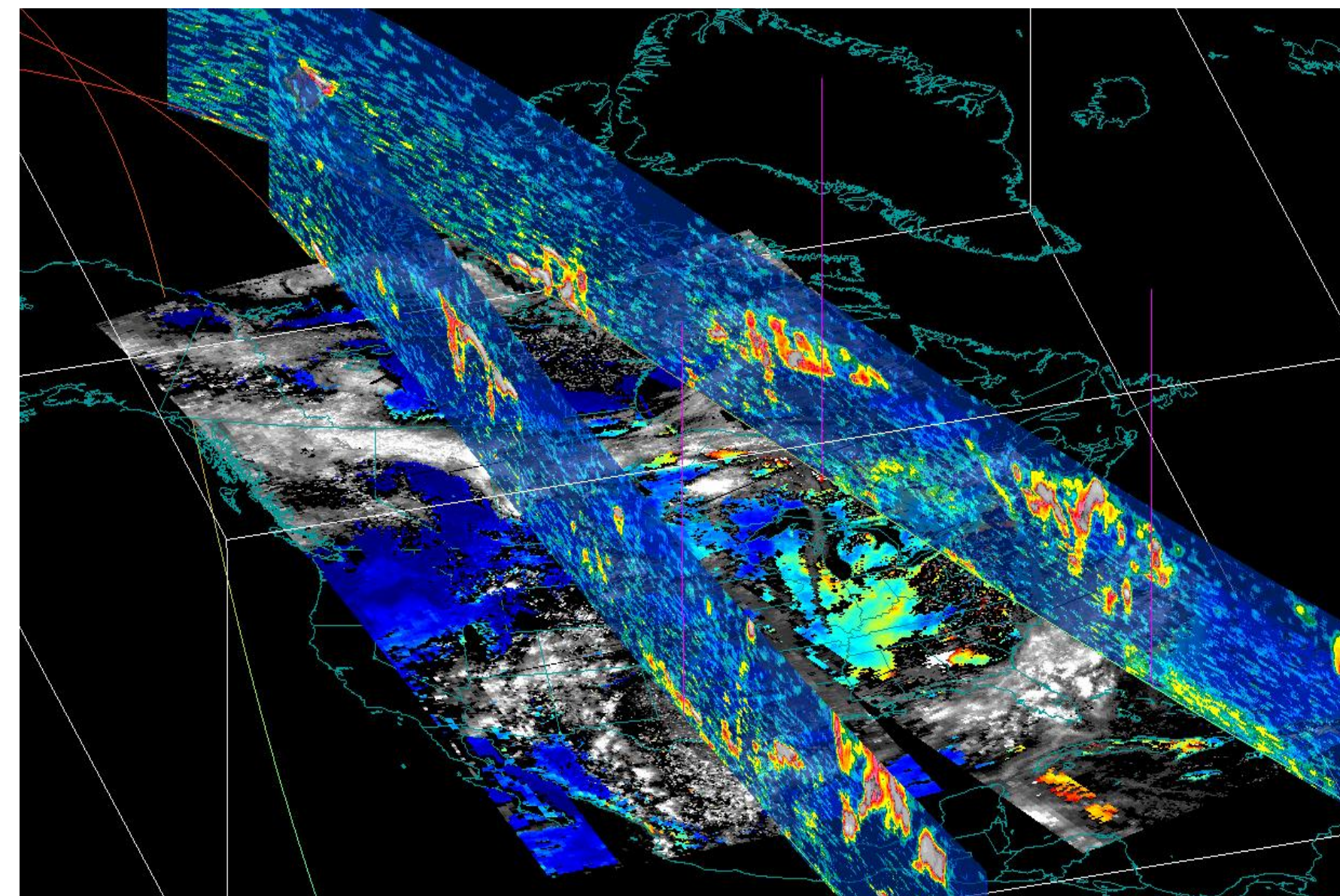
Data from EUMETCast and GEONETCast Americas

McIDAS-V has a 'globe' projection capability that is easily accessed from any other geophysical projection. The globe can be animated in time and rotated, and other data sources can be added to the globe display. In the two color images, Total Ozone from the GEONETCast TOAST product is displayed on a 2D (lower left) and 3D (upper left) global projection. In the lower right, Tropospheric Humidity product available on EUMETCast in BUFR format.
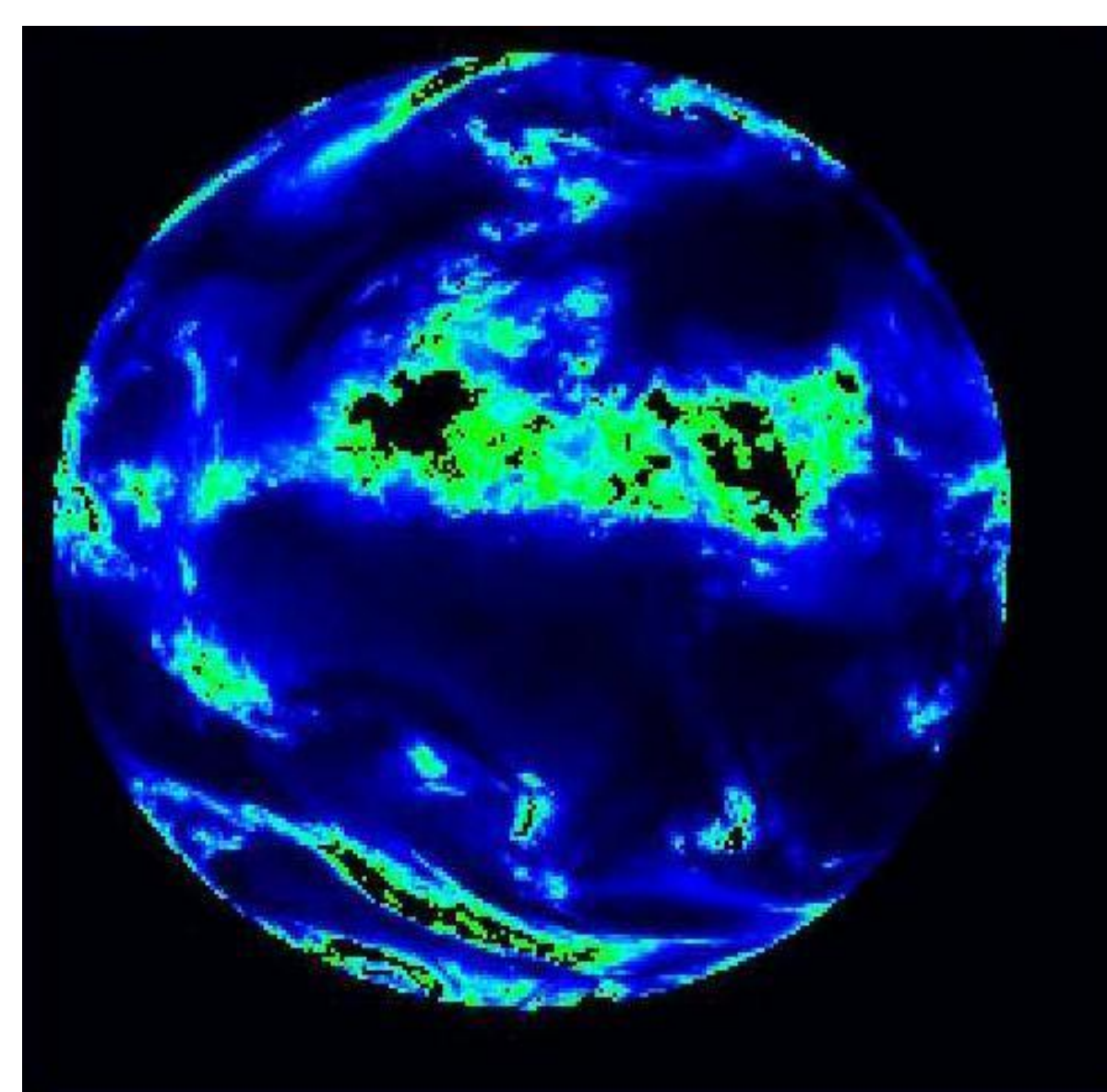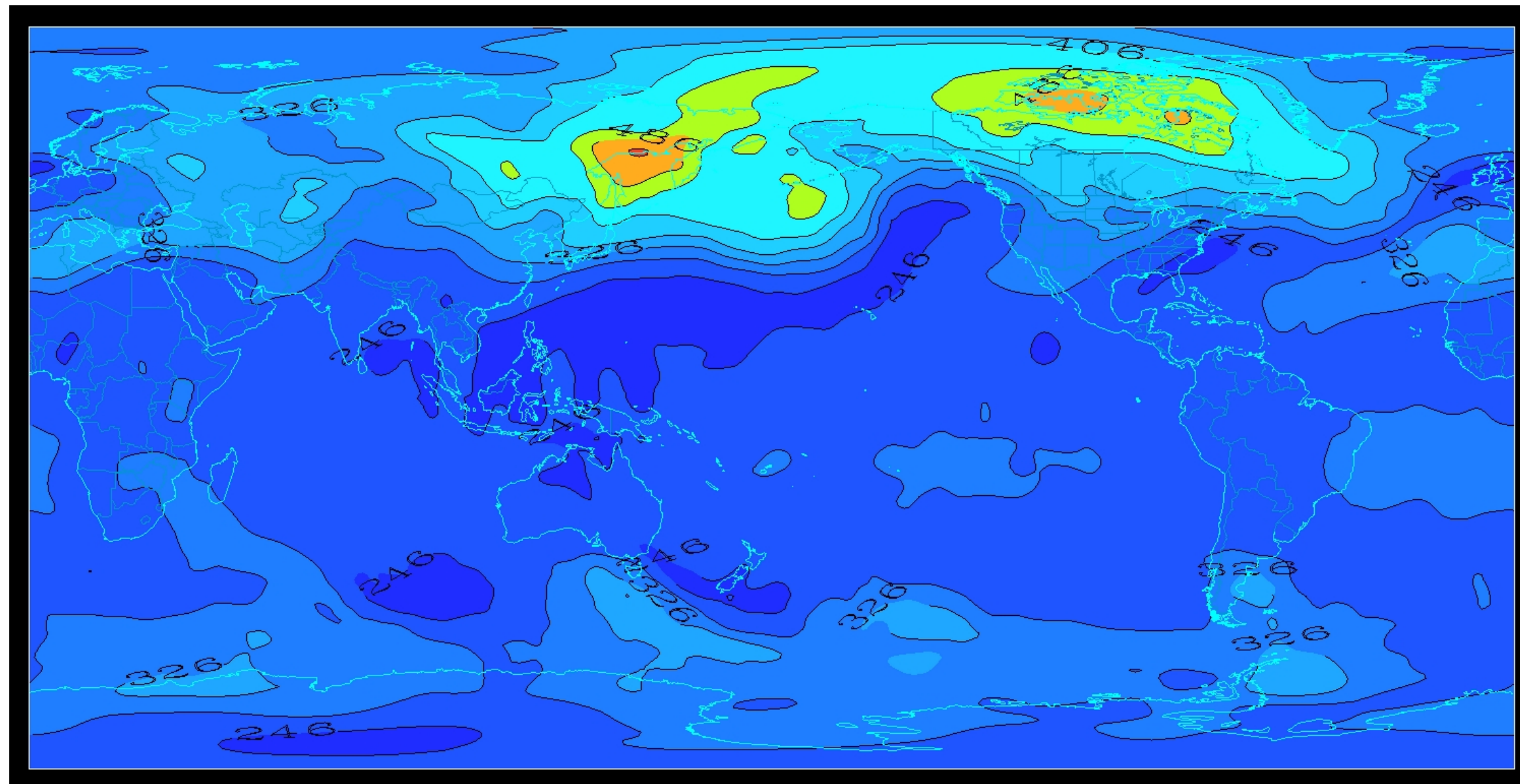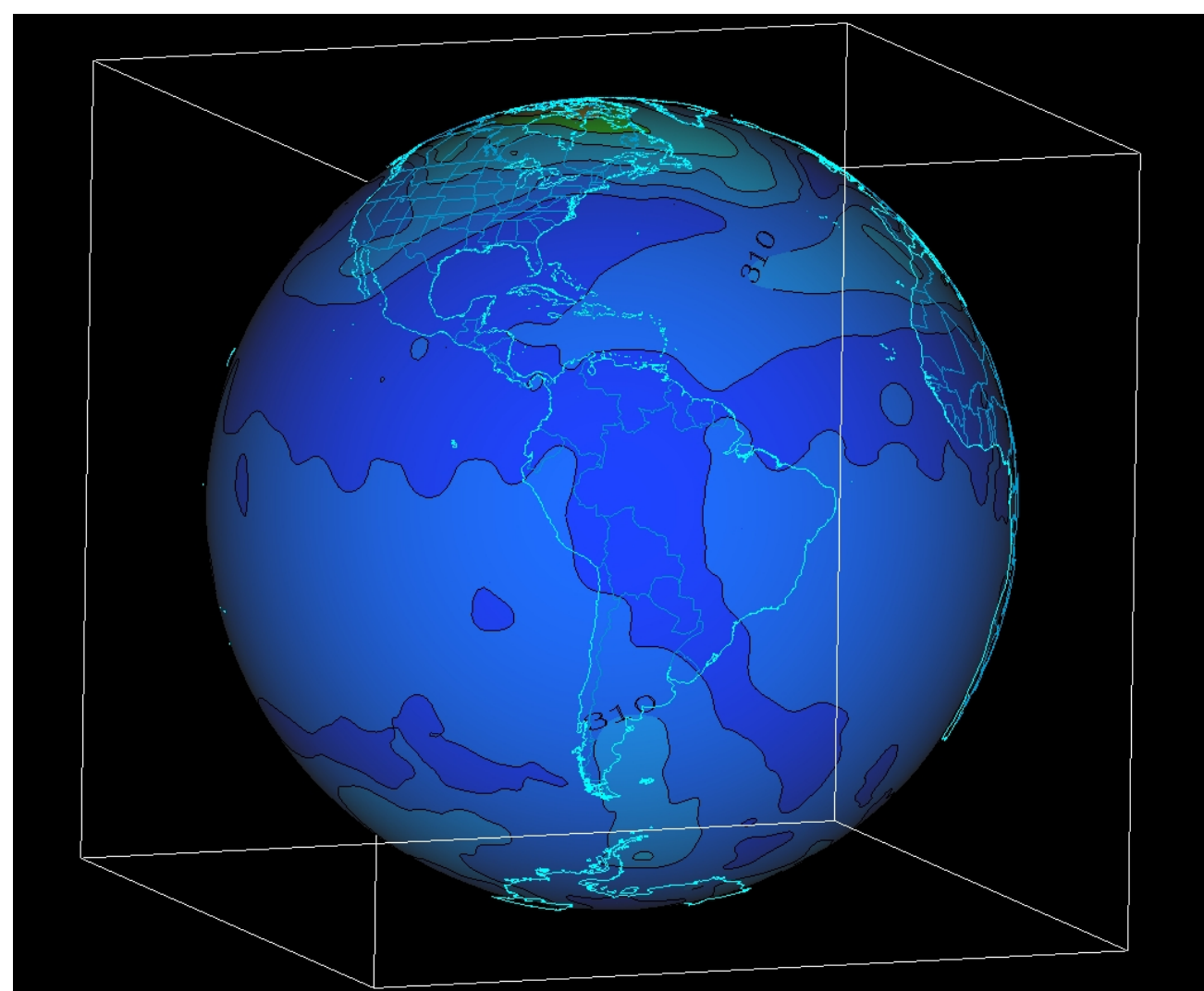
Powerful Data Analysis Tools

Shown below is proxy AWG Cloud Height (color coded based on height) with CALIPSO lidar. The diagonal line is the CALIPSO track; the heights along that line are displayed in the right panel. Lower panel has sampled CTH (magenta) along lidar heights (green). This demonstrates the powerful interactive and data integration capabilities of McIDAS-V.
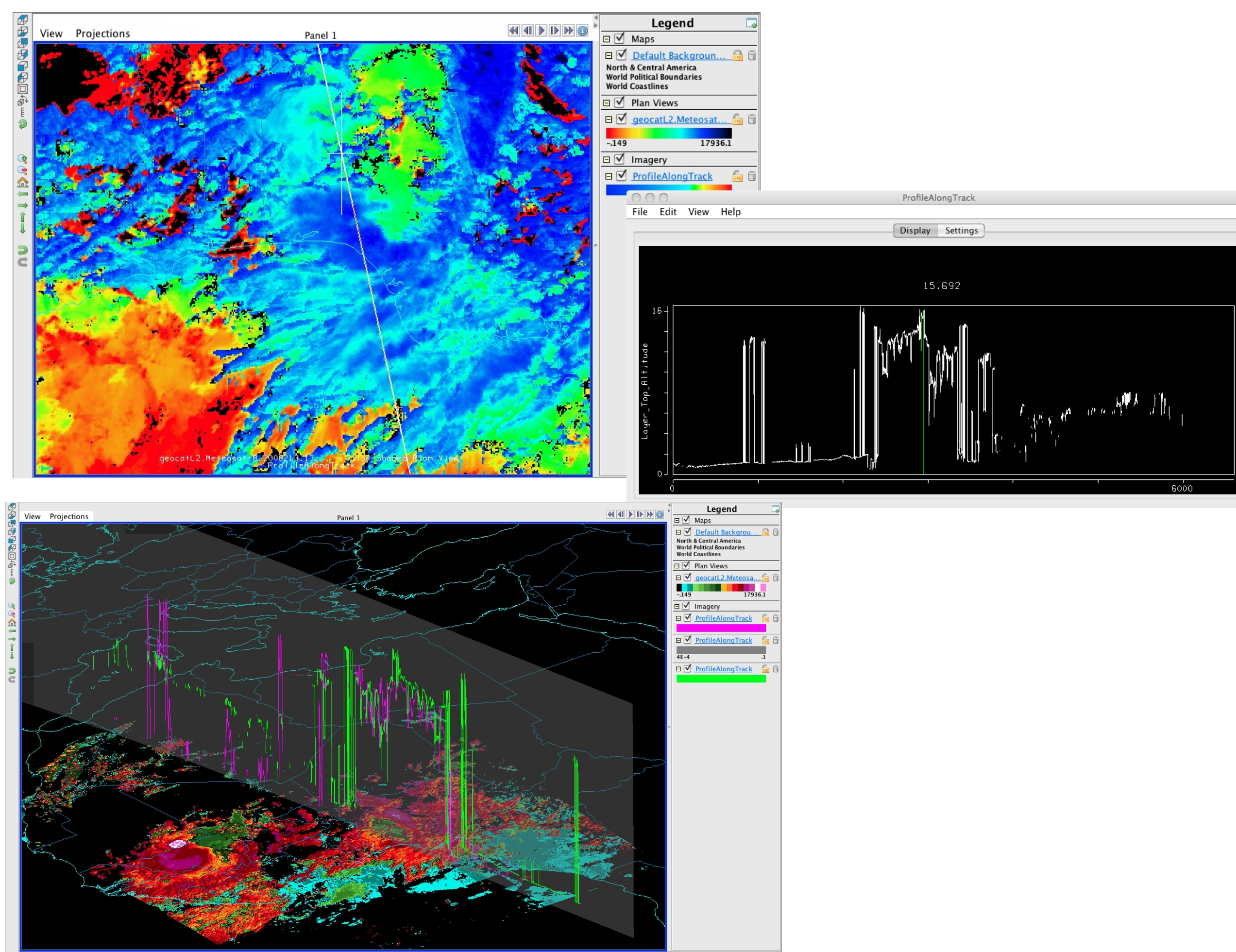
Developing Tools for Training

A significant effort has gone into the development of user's guides and training materials to assist both the novice and the expert working with McIDAS-V.

Training tutorials contain step-by-step instructions on how to perform such tasks as displaying a satellite image, a radar display or model field output. The training tutorials also contain sample data sets with instructions on loading, displaying and working with the data. There are training tutorials for more advanced features of McIDAS-V, like the HYDRA analysis tools. The tutorial on working with Hyperspectral Data includes instructions on how to create analysis products such as scatter plots and transects.

SSEC has developed instructional videos demonstrating how to perform basic and advanced tasks. These videos have narrative and are designed to be brief and to the point.

http://www.ssec.wisc.edu/mcidas/software/v/documentation.html